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Tibiotalocalcaneal Arthrodesis Using a Supracondylar Femoral Nail for Avascular Necrosis of the Talus

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Abstract

Tibiotalocalcaneal arthrodesis using a supracondylar femoral nail for advanced tuberculous arthritis of the ankle had been described by Gavaskar *et al.* in 2009[7]. We describe here our experience with patients who underwent arthrodesis of the ankle using a supracondylar femoral nail for pain and/or instability resulting from post-traumatic avascular necrosis. All the three patients had undergone tibiotalocalcaneal arthrodesis using a short supracondylar femur nail between September 2017 and March 2019. At postoperative year one, the mean FAOS for pain improved to 76 from 25, whereas the mean FAOS for quality of life improved to 63 from 11. We achieved our intended goal of obtaining a tibiotalocalcaneal arthrodesis using a supracondylar femoral nail with satisfactory functional outcomes. Tibiotalocalcaneal arthrodesis using a supracondylar femoral nail appears to be an acceptable solution as a low-cost procedure in patients requiring ankle fusion.

Keywords: Ankle arthrodesis; Avascular necrosis; Supracondylar femoral nail

Introduction

Ankle arthrodesis is primarily indicated for the reduction of pain, correction of deformity and bringing stability to an ankle joint as the need may be. These may be a result of osteoarthritis, post-traumatic arthritis, avascular necrosis (AVN) of the talus or failed total ankle arthroplasty with a subtalar intrusion. It remains the standard reconstructive technique for the treatment of severe disabling pain in the ankle. The procedure was 1st described by Albert in the year 1882.[1] Charnley in 1951 introduced the concept of addition of compression to the procedure significantly bringing down the rates of non-union.[2] Other procedures like ankle arthroplasty which developed in the 1970s and '80s did not match the success of ankle fusion nor could they replicate the success of other joint replacements.[3] Hence, ankle arthrodesis continues to remain as the current treatment of choice. Scores of techniques and countless modifications have been advocated.[4] Tibiotalocalcaneal arthrodesis using modified short retrograde nails inserted from the calcaneum has also been described.[5,6] The high cost of these specialized, modified ankle arthrodesis nail systems especially in a developing country like India mandated the requirement of cheaper alternatives. Tibiotalocalcaneal arthrodesis using a supracondylar femoral nail for advanced tuberculous arthritis of the ankle had been described by Gavaskar *et al*. in 2009.[7] We describe here our experience with patients who underwent arthrodesis of the ankle using a supracondylar femoral nail for pain and/or instability resulting from post-traumatic avascular necrosis.

Material and Methods

All the three patients had undergone tibiotalocalcaneal arthrodesis using a short supracondylar femur nail between September

2017 and March 2019. The patients had presented with a complaint of pain and swelling of the ankle joint with a prior history of trauma (18 months to 37 months earlier resulting from a fall from height-1 case or road traffic accident-2 cases). The pain was exacerbated on walking Radiographs showed old talus fracture with sclerosis in the body of the talus along with subtalar arthritis in all the 3 cases. MRI confirmed avascular necrosis of the talus. All the patients were operated under spinal anaesthesia under tourniquet control. The ankle was approached through an anterolateral incision. The body of the talus was debrided and the residual fragments were removed. Medial malleolus osteotomy was performed (to medialise the calcaneum). Keeping the foot in plantigrade position and 5 degrees of valgus an entry point was created in the calcaneum. A guidewire was placed through the heel pad in line with the centre of the tibia. It passed through the calcaneus just anterior to the posterior facet. The pin went into the centre of the medullary canal of the tibia under fluoroscopic guidance. We followed the method described by Stephenson *et al*. to find our entry point. This was at the intersection of 2 lines, one line in the sagittal plane passing from the 2nd toe to the centre of the heel; the other line in the coronal plane at the junction of the anterior and middle thirds of the heel pads. The guide pin was passed and its passage in 2 planes was checked under fluoroscopy for the supracondylar femoral nail. The nail was 26 to 30 cm long and reaming was done up to 10–12 mm as per requirement. Care was taken to bury the nail well into the calcaneum. The nail was locked distally in calcaneum with 2 screws and proximally locked with two screws in the tibia in lateral to medial direction. Cancellous autologous bone graft was used to fill the void created in the ankle after maintaining the limb length. The tourniquet was

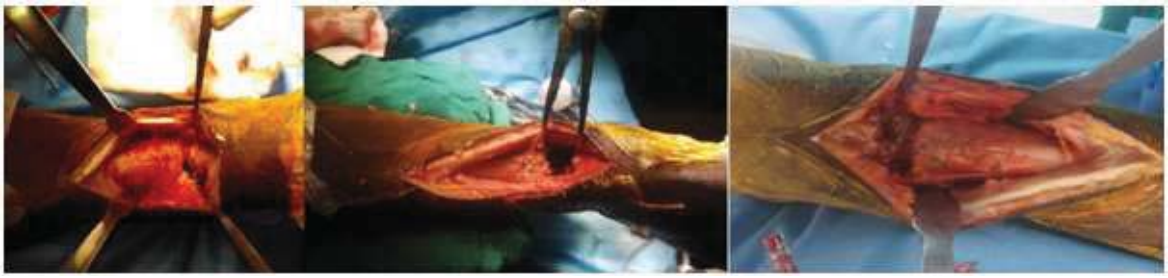

Fig. 1: A Intraoperative images of the exposure through the anterolateral approach with the B resultant void after debridement and C with bone grafting.

Fig. 2: A Preoperative xrays in a patient with AVN Talus B Supracondylar nail being inserted C Postoperative xrays in the same patient

Fig. 3: Post operative images after 3 months showing A AP & Lat views of ankle B Clinical images

released and haemostasis achieved. A compression dressing was applied after skin closure. Patients were advised non-weight bearing mobilization after the 2nd postoperative day dressing. Full weight bearing was advised after radiological signs of the union on x-ray. The pre- and one-year post-operative Foot and Ankle Outcome Scores (FAOS) of the patients were compared.

Results

The mean operating time was 100 minutes (range 94–106 minutes). The average estimated blood loss was 250 (range, 200–350) ml. No patient had any major complication or hardware failure, none of the patients had any superficial skin infections. In one patient there was a small wound site dehiscence which was closed and resolved uneventfully. All patients returned to their normal day-to-day activities. 1 patient had mild pain but required sporadic analgesics only. ESR was normal at the end of 12 weeks (10–14 weeks range). At postoperative year one, the mean FAOS for pain improved to 76 from 25, whereas the mean FAOS for quality of life improved to 63 from 11.

Discussion

Ankle arthrodesis is considered in patients who have limited motion of the ankle with chronic pain. The underlying diagnosis may range from Posttraumatic arthritis, Osteoarthritis, Arthritis from chronic instability of the ankle, Rheumatoid or autoimmune inflammatory arthritis, Gout, Postinfectious arthritis, Charcot neuroarthropathy, Osteonecrosis of the talus, Failure of total ankle arthroplasty to Instability of the ankle from neuromuscular disorders.

Vascular impairment of the limb and infection of the skin through which the approach is planned are considered as absolute contraindications.

Many techniques, approaches and procedures have been described as well as performed to achieve tibiotalocalcaneal arthrodesis.[8-11] Gerhard Kuntscher described a method of combined arthrodesis of the ankle and subtalar joints in his text entitled "The Practice of Intramedullary Nailing". Drs. Johnson and Gehrke described using an IM nail for tibiotalocalcaneal fusion at the 1993 Summer Meeting of the American Orthopaedic Foot and Ankle Society.[9] 100% union rates have been described after tibiotalocalcaneal arthrodesis with intramedullary fixation in nonneuropathic patients. The procedure has become even more successful after the availability of better fixation devices like the intramedullary ankle fusion nail. But this also signifies the underlying concept that Kuntscher's initial description of using intramedullary fixation is still a solid yet cheap alternative.

One of the key elements while evaluating the success of ankle arthrodesis includes patient satisfaction. In our study, it was better than what was reported for other methods such as external fixator and screw arthrodesis while mimicking satisfaction levels of the costlier customised tibio-talo-calcaneal nails.[12,13] Due to the low number of cases that we did in this study, it was not appropriate to compare the union rates or the requirement of an additional procedure.

Several structures on the plantar aspect of the foot are at grave risk while inserting a retrograde nail.[14] We avoided damage to these structures by a short straight incision in the sole of the foot along with blunt dissection.

We achieved our intended goal of obtaining a tibiotalocalcaneal arthrodesis using a supracondylar femoral nail with satisfactory functional outcomes.

Conclusion

Ankle arthrodesis results in the clinical improvement of pain and function in most of the patients. Tibiotalocalcaneal arthrodesis using a supracondylar femoral nail appears to be an acceptable solution as a low-cost procedure in patients requiring ankle fusion. Further studies with larger groups and comparison studies are required to fully validate the usefulness of this procedure in AVN patients requiring ankle arthrodesis.

Table 1: The pre and one-year postoperative Foot and Ankle Outcome Scores (FAOS) of the patients

Serial No	Pain FAOS		Quality of life FAOS	
	Pre-op	1-year post op	Pre-op	1-year post op
1	24	72	16	75
2	36	78	10	57
3	15	80	7	59

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